Drinking Water Surveillance Program

ATIKOKAN WATER TREATMENT PLANT

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ATIKOKAN
WATER TREATMENT PLANT

DRINKING WATER SURVEILLANCE PROGRAM

ANNUAL REPORT 1988

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EXECUTIVE SUMMARY

DRINKING WATER SURVEILLANCE PROGRAM

ATIKOKAN WATER TREATMENT PLANT
1988 ANNUAL REPORT

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. Currently, 52 plants are being monitored.

The Atikokan Water Treatment Plant is a direct filtration plant which treats water from the Atikokan River which is typically highly coloured. The treatment process consists of coagulation, ozonation, filtration, disinfection and fluoridation. This plant has a design capacity of 3.1 x 1000 m^3/day and serves a population of approximately 4,400.

Water samples of the raw and treated water from the plant and from two locations in the distribution system were taken on a monthly basis beginning in October. The Atikokan Water Treatment Plant was sampled for approximately 160 parameters. Parameters were divided into the following groups: Bacteriological, Inorganic and Physical (Laboratory Chemistry, Field Chemistry and Metals) and Organic (Chloroaromatics, Chlorophenols, Pesticides and PCB, Phenolics, Polynuclear Aromatic Hydrocarbons, Specific Pesticides and Volatiles). Chlorophenols and Specific Pesticides were analysed in November only. Phenols and PAHs are only analysed in the water from the plant.

A summary of results is shown in Table 1.

Inorganic and Physical parameters were below any applicable health related ODWOs.

Of a total of approximately 110 Organic parameters tested for on a monthly basis, none exceeded health related guidelines.

During 1988 the limited DWSP sampling results indicated that the Atikokan Water Treatment Plant produced good quality water at the plant and this quality was maintained in the distribution system.

TABLE 1

DRINKING WATER SURVEILLANCE PROGRAM ATIKOKAN WTP

SUMMARY TABLE BY SCAN

	SCAN	RAW			TREATED			SITE 1			SITE 2		
		TESTS	POSITIVE	%POSITIVE	TESTS	POSITIVE	%POSITIVE	TESTS	POSITIVE	%POSITIVE	TESTS	POSITIVE	%POSITIVE
	CHEMISTRY (FLD)	9	9	100	18	18	100	26	26	100	36	36	100
	CHEMISTRY (LAB)	60	43	71	59	50	84	105	95	90	105	92	87
	METALS	72	30	41	72	34	47	141	69	48	141	74	52
	CHLOROAROMATICS	42	0	0	42	0	0	28	0	0	42	0	0
	CHLOROPHENOLS	6	0	0	0	0	0	.	.	.	.	.	.
	PAH	34	0	0	51	0	0	.	.	.	.	.	.
	PESTICIDES & PCB	102	0	0	89	0	0	68	0	0	102	0	0
	PHENOLICS	3	3	100	3	3	100	.	.	.	.	.	.
	SPECIFIC PESTICIDES	8	0	0	2	0	0	1	0	0	2	0	0
	VOLATILES	29	0	0	58	6	10	58	6	10	58	6	10
TOTAL		365	85		394	111		427	196		486	208	

NO HEALTH RELATED GUIDELINES WERE EXCEEDED

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE
A '.' INDICATES THAT NO SAMPLE WAS TAKEN

DRINKING WATER SURVEILLANCE PROGRAM

ATIKOKAN WATER TREATMENT PLANT
1988 ANNUAL REPORT

INTRODUCTION

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. Currently, 52 plants are being monitored. Appendix A contains a detailed description of the DWSP.

The DWSP was initiated at the Atikokan Water Treatment Plant in October 1988.

This report contains information and results for limited analysis completed in 1988.

PLANT DESCRIPTION

The Atikokan Water Treatment Plant is a direct filtration plant which treats water from the Atikokan River which is typically highly coloured. The process consists of coagulation, ozonation, filtration, disinfection and fluoridation. A polyelectrolyte is added as a coagulant aid, sodium carbonate is added when necessary

for pH adjustment. The ozone is employed in a colour removal process. The plant has a design capacity of 3.1 x 1000 m^3/day and sample day flows ranging from 2.3 x 1000 m^3/day to 3.4 x 1000 m^3/day. This plant serves a population of 4,442.

The plant location is shown in Figure 1. Plant process details, in a block schematic, are shown in Figure 2. General plant information is presented in Table 2.

METHODS

Water samples were obtained from four DWSP approved locations;

i) Plant Raw - The water originated from the lowlift discharge prior to ozonation and was sampled through a stainless steel sample line. The sample tap is located near the lowlift discharge.

ii) Plant Treated - The water originated from the highlift discharge after addition of all treatment chemicals and was sampled through a stainless steel sample line. The sample tap is located near the highlift discharge.

iii) Distribution System - Site 1 - This house is located close to the plant. The type and location of the sample line is unavailable.

iv) Distribution System - Site 2 - This house is located at the

farther end of the distribution system. The type and location of the sample line is unavailable.

Sample lines in the plant were flushed prior to sampling to ensure that the water obtained was indicative of its origin and not residual water standing in the sample line.

At the distribution system location two types of samples were obtained: a standing and a free flow. The standing sample consisted of water that had been in the household plumbing and service connection for a minimum of six hours. These samples are used to make an assessment of the amount by which the levels of inorganic compounds and metals may be changed on standing due to leaching from (or deposition on) the plumbing system. The only analyses carried out on the standing samples therefore, are General Chemistry and Metals. The free flow sample represented fresh water from the distribution main that had been flowing at the sample tap for five minutes before being sampled.

Attempts were made to capture the same block of water at each sampling point by taking the retention time into consideration. The retention time was calculated by dividing the volume of water between the two sampling points by the sample day flow. For example, if it was determined that the retention time within the plant was five hours then there would be a five hour interval between the raw and treated sampling. Similarly, if it was

FIGURE 1

DRINKING WATER SURVEILLANCE PROGRAM

SITE LOCATION MAP

ATIKOKAN WATER TREATMENT PLANT

FIGURE 2

ATIKOKAN WATER TREATMENT PLANT

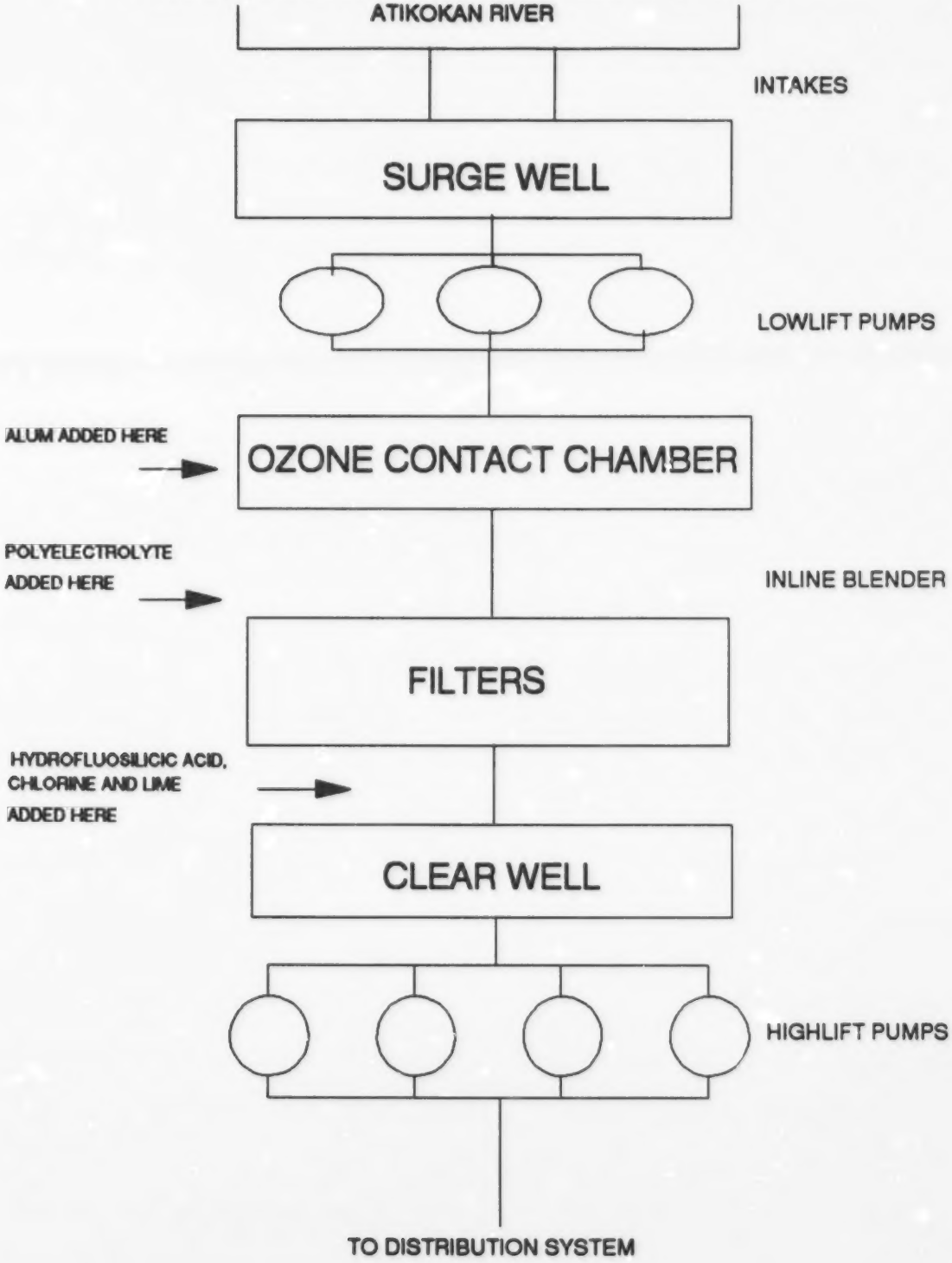

TABLE 2

DRINKING WATER SURVEILLANCE PROGRAM ANNUAL REPORT

GENERAL INFORMATION

ATIKOKAN WATER TREATMENT PLANT

LOCATION:	P.O. BOX 689 ATIKOKAN, ONTARIO P0T 1C0 (807-597-2390)
SOURCE:	RAW WATER SOURCE - ATIKOKAN RIVER AT LITTLE FALLS
DESIGN CAPACITY:	14.09 (1000 M^3/DAY)
OPERATION:	MUNICIPAL
PLANT SUPERINTENDENT:	D. VERSTEEG
MINISTRY REGION:	NORTHWEST
DISTRICT OFFICER:	P. FOX

MUNICIPALITY SERVED	POPULATION
ATIKOKAN	4,442

estimated that it took approximately one day for the water to travel from the plant to the distribution system site, this site would be sampled one day after the treated water from the plant.

Stringent DWSP sampling protocols were followed to ensure that all samples were taken in a uniform manner (Appendix B).

Sample day flow, treatment chemical dosages and Field Chemistry measurements such as Turbidity, Chlorine Residuals, pH and Temperature were recorded on the day of sampling and were entered on the DWSP data base as submitted.

RESULTS

The Atikokan Water Treatment Plant and two locations in the distribution system were sampled for approximately 160 parameters on a monthly basis beginning in October.

The Specific Pesticides and Chlorophenols scans were sampled in November only. Polynuclear Aromatic Hydrocarbons and Phenolics were only analysed in the raw and treated water at the plant.

Table 3 contains information on the sample day retention time, flow rate and treatment chemicals used and their associated dosages.

Table 4 is a summary break-down of the number of water samples

analysed for by parameter and by water type. The number of times that a positive or trace result was detected is also reported.

Positive denotes that the result is greater than the statistical limit of detection established by the Ministry of the Environment (MOE) laboratory staff and is quantifiable. Trace (<T) denotes that the level measured is greater than the lowest value detectable by the method but lies so close to the detection limit that it cannot be confidently quantified.

Table 5 presents the results for parameters detected on at least one occasion.

Table 6 lists all parameters analysed in the DWSP.

Associated guidelines and detection limits are also supplied on both tables. Parameters are listed alphabetically within each scan.

DISCUSSION

General

Water quality is judged by comparison with the Ontario Drinking Water Objectives (ODWOs) as defined in the 1984 publication (ISBN 0-7743-8985-0). The Province of Ontario has health related and aesthetic objectives for 49 parameters, these are are currently

under review. When an ODWO is not available guidelines/limits from other agencies are consulted. The Parameters Listing System (PALIS) recently published (ISBN 0-7729-4461-X) by the MOE catalogues and keeps current over 1750 guidelines for 650 parameters from agencies throughout the world.

Although some of the parameters measured on DWSP may be present in the raw and treated water as a result of pollution, many of the compounds detected are naturally occuring or are treatment by-products.

Plant operational personnel address occurrences of taste and odour or biological water quality parameters. The DWSP does not assess these aspects of the water supply.

As stated under Results, traces do not indicate quantifiable values, as defined by established MOE Laboratory analytical reporting protocols. The occasional finding of a trace level of a contaminant is thus not considered to be significant. They can be useful in trend analysis, or confirmation of the presence of a specific contaminant that is repeatedly detected at these levels. **DISCUSSION OF GUIDELINES AND LIMITS THEREFORE, IS ONLY CONDUCTED ON POSITIVE RESULTS.**

Bacteriology

Bacteriological analysis were not carried out because samples were not received in the allotted time for analysis. Routine Bacteriological monitoring as recommended in the ODWOs is carried out by the operating authority.

Inorganic and Physical Parameters

Laboratory and Field Chemistry

The ODWO of 1.0 FTU for Turbidity was exceeded in samples analysed in the Laboratory at 2.42 FTU in October, 1.61 FTU in November and 1.53 FTU in December. However, Field Turbidity results were less than the laboratory measured values and below the ODWO. The length of time elapsed between sampling and analysis may explain the differences; discrepancies between the Laboratory Turbidity and Field Turbidity determinations are being investigated. The District Officer was notified on all occasions.

Colour values exceeded the aesthetic ODWO of 5 True Colour Units (TCU) in all treated water samples, standing and free flow samples. Colour in drinking water may be due to the presence of natural or synthetic organic substances as well as certain metallic ions.

The Langelier Index is used extensively in estimating the corrosion potential of water. An increasingly negative index indicates the

increasing possibility of corrosion. It is considered sound engineering practice to maintain a slightly positive Langelier Index. The Langelier Index for Atikokan is consistently negative.

As part of the treatment process, hydrofluosilicic acid is added to the treated water (Table 3). Where fluoridation is practiced, the Fluoride concentration recommended in the ODWO is 1.2 mg/L, plus or minus 0.2 mg/L. Results indicate that this level was not maintained.

Metals

The results reported for the Metal scan were below any applicable ODWOs.

Elevated levels of Copper, Nickel, Lead and Zinc were detected in the standing samples as compared to the free flow distribution samples, indicating that these metals were leached from the household plumbing as the water stood overnight. The Langelier Index indicates that the water has a tendency to corrode.

At present, there is no evidence that Aluminum is physiologically harmful and no health limit for drinking water has been specified. The measure of residual Aluminum in the treated water is important to indicate the efficiency of the treatment process. The ODWOs indicate that a useful guideline is to maintain a residual below 100 ug/L as Al in the water leaving the plant to avoid problems in

the distribution system. Aluminum values exceeded the ODWO operational guideline in all of the treated water and distributed water samples.

Organic Parameters

Chloroaromatics

The results of the Chloroaromatics scan showed that no chloroaromatics were detected.

Chlorophenols

The results of the Chlorophenol scan showed that no Chlorophenols were detected.

Pesticides and PCB

Results of the Pesticides and PCB scan showed that no PCBs were detected and that two pesticides were detected:

Alpha BHC

Lindane

There are several isomers of BHC (benzene hexachloride); gamma BHC is the active ingredient of the pesticide Lindane, while alpha BHC is the isomer most predominantly found in surface waters of the Great Lakes basin as indicated by results from other water supplies on DWSP.

Alpha BHC was detected at trace levels, in the samples of raw water, treated water and Site 2 water taken for the same sampling period.

Lindane was detected at trace levels, in one raw water, one treated water and one Site 2 water.

Specific Pesticides

The results of the Specific Pesticide scan showed that none were detected.

Phenolics

Phenolics were detected three times in the raw water and three times in the treated water at 3.5 ug/L and 5.2 ug/L in October, 3.6 ug/L and 4.6 ug/L in November and 2.0 ug/L and 3.0 ug/L in December respectively. The maximum desirable concentration of phenolic substances in drinking water is 2.0 ug/L. This limit has been set primarily to prevent the occurrence of undesirable tastes and odours, particularly in chlorinated water. Phenolic compounds are present in the aquatic environment as a result of natural and/or industrial processes.

Polynuclear Aromatic Hydrocarbons (PAH)

The results of the PAH scan showed that no PAHs were detected.

Volatiles

The results of the Volatile scan showed that four parameters, other than Trihalomethanes(THMs) were detected:

Toluene

Ethylbenzene

Styrene

Tetrachloroethylene

Toluene was detected at trace levels, once in the raw water, once in the treated water and once in the Site 2 water. The detection of toluene at low, trace levels is a laboratory artifact derived from the analytical methodology. The purge-and-trap analytical technique depends on the purging of the volatile organics in the water sample with helium gas onto a Tenax trapping column. The volatile materials are subsequently thermally desorbed, separated and quantified. Tenax, a toluene-like polymeric material, tends to decompose sporadically upon heating into toluene and other aromatic componenets (ethylbenzene and xylene) giving instrument blanks in the order of 0.05 ug/L.

The detected trace levels of Styrene are also considered to be laboratory artifacts due to the outgassing of monomeric styrene from the polystyrene shipping containers. The sporadic background levels from this source are in the order of 0.05 ug/L.

Ethylbenzene was detected at a trace level, once in the raw water.

The volatiles listed above are typically found on an occasional basis at other water supplies included on the DWSP, usually at trace levels.

Tetrachloroethylene was detected at a trace level, once in the distribution system Site 2 water.

THMs are known to be produced during the water treatment process and will always occur in chlorinated surface waters. THMs are comprised of Chloroform, Chlorodibromomethane and Dichlorobromomethane. Bromoform occurs occasionally. Results are reported for the individual compounds as well as for total THMs.

Chloroform, Chlorodibromomethane, Dichlorobromomethane and Total THMs were detected in all treated waters. All Total THM occurrences, ranging from 84.45 ug/L to 200.6 ug/L were below the ODWO of 350 uG/L.

CONCLUSIONS

The Atikokan Water Treatment Plant for the limited sampling period of 1988 produced good quality water at the plant and this was in throughout the distribution system.

No health related guidelines, for inorganic or organic parameters,

were exceeded during 1988.

Whilst no health related drinking water guidelines were exceeded, the water quality produced by the Atikokan Water Treatment Plant could not be considered satisfactory because of consistently high colour values in the treated water, the inability to achieve the recommended fluoride levels, the inability to fully control the corrosion potential of the water and the high residual aluminum levels.

RECOMMENDATIONS

Three recommendations can be made:

1) The fluoridation practice should be modified to ensure that the recommended level is maintained.

2) Corrosion control practices may need to be modified.

3) High aluminum residuals indicating possible treatment problems may warrant further attention.

TABLE 3

DRINKING WATER SURVEILLANCE PROGRAM ATIKOKAN WTP SAMPLE DAY CONDITIONS FOR 1988

	SAMPLE DAY CONDITIONS		TREATMENT CHEMICAL DOSAGES (MG/L)					
			OZONATION	COAGULATION	COAGULATION AID	FLUORIDATION	POST PH ADJUSTMENT	POST-CHLORINATION
			OZONE	ALUM LIQUID	POLYELECTROLYTE	HYDROFLUOSILICIC ACID	SODIUM CARBONATE	CHLORINE
DATE	RETENTION TIME(HRS)	FLOW (1000 M3)						
OCT 28	28.2	3.4	04.55	11.10	00.19	01.01	09.61	06.30
NOV 29	40.5	2.3	04.55	08.11	00.19	.	.	08.11
DEC 20	34.0	2.8	03.77	09.61	00.16	.	.	04.55

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM ATIKOKAN WTP

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	RAW			TREATED			SITE 1			SITE 2		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
CHEMISTRY (FLD)	FLD CHLORINE (COMB)	.	.	.	3	3	0	3	3	0	6	6	0
	FLD CHLORINE FREE	.	.	.	3	3	0	2	2	0	6	6	0
	FLD CHLORINE (TOTAL)	.	.	.	3	3	0	4	4	0	6	6	0
	FLD PH	3	3	0	3	3	0	6	6	0	6	6	0
	FLD TEMPERATURE	3	3	0	3	3	0	5	5	0	6	6	0
	FLD TURBIDITY	3	3	0	3	3	0	6	6	0	6	6	0
*TOTAL SCAN CHEMISTRY (FLD)		9	9	0	18	18	0	26	26	0	36	36	0
CHEMISTRY (LAB)	ALKALINITY	3	3	0	3	3	0	6	6	0	6	6	0
	CALCIUM	3	3	0	3	3	0	6	6	0	6	6	0
	CYANIDE	3	0	0	3	0	0	3	0	0	3	0	0
	CHLORIDE	3	3	0	2	2	0	6	6	0	6	6	0
	COLOUR	3	3	0	3	3	0	6	6	0	6	6	0
	CONDUCTIVITY	3	3	0	3	3	0	6	6	0	6	6	0
	FLUORIDE	3	0	3	3	3	0	6	6	0	6	6	0
	HARDNESS	3	3	0	3	3	0	6	6	0	6	6	0
	IONCAL	3	3	0	3	2	0	6	6	0	6	6	0
	LANGELIERS INDEX	0	0	0	0	0	0	0	0	0	0	0	0
	MAGNESIUM	3	3	0	3	3	0	6	6	0	6	6	0
	SODIUM	3	3	0	3	3	0	6	6	0	6	6	0
	AMMONIUM TOTAL	3	3	0	3	3	0	6	5	1	6	4	2
	NITRITE	3	1	2	3	2	1	6	4	2	6	3	3
	TOTAL NITRATES	3	0	2	3	0	3	6	2	4	6	1	5

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM ATIKOKAN WTP

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	SITE RAW TOTAL	RAW POSITIVE	RAW TRACE	TREATED TOTAL	TREATED POSITIVE	TREATED TRACE	SITE 1 TOTAL	SITE 1 POSITIVE	SITE 1 TRACE	SITE 2 TOTAL	SITE 2 POSITIVE	SITE 2 TRACE
CHEMISTRY (LAB)	NITROGEN TOT KJELD	3	3	0	3	3	0	6	6	0	6	6	0
	PH	3	3	0	3	3	0	6	6	0	6	6	0
	PHOSPHORUS FIL REACT	3	0	3	3	3	0	.	.	.	.	.	.
	PHOSPHORUS TOTAL	3	0	3	3	2	1	.	.	.	.	.	.
	SULPHATE	3	3	0	3	3	0	6	6	0	6	6	0
	TURBIDITY	3	3	0	3	3	0	6	6	0	6	6	0
*TOTAL SCAN CHEMISTRY (LAB)		60	43	13	59	50	5	105	95	7	105	92	10
METALS	SILVER	3	0	0	3	0	0	6	0	2	6	0	0
	ALUMINUM	3	3	0	3	3	0	6	6	0	6	6	0
	ARSENIC	3	1	2	3	2	1	6	2	4	6	4	2
	BARIUM	3	3	0	3	3	0	6	6	0	6	6	0
	BORON	3	0	3	3	0	3	6	1	5	6	0	6
	BERYLLIUM	3	0	1	3	0	0	6	0	3	6	0	2
	CADMIUM	3	0	0	3	0	0	6	0	1	6	0	1
	COBALT	3	0	3	3	0	3	6	0	6	6	0	6
	CHROMIUM	3	1	2	3	2	1	6	6	0	6	5	1
	COPPER	3	3	0	3	3	0	6	6	0	6	6	0
	IRON	3	3	0	3	3	0	6	6	0	6	6	0
	MERCURY	3	2	0	3	3	0	3	0	0	3	2	0
	MANGANESE	3	3	0	3	3	0	6	6	0	6	6	0
	MOLYBDENUM	3	0	3	3	0	3	6	0	6	6	0	6
	NICKEL	3	0	3	3	0	3	6	1	5	6	3	3

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM ATIKOKAN WTP

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	SITE RAW TOTAL	RAW POSITIVE	RAW TRACE	TREATED TOTAL	TREATED POSITIVE	TREATED TRACE	SITE 1 TOTAL	SITE 1 POSITIVE	SITE 1 TRACE	SITE 2 TOTAL	SITE 2 POSITIVE	SITE 2 TRACE
METALS	LEAD	3	2	1	3	2	1	6	6	0	6	6	0
	ANTIMONY	3	1	2	3	1	1	6	5	1	6	6	0
	SELENIUM	3	0	0	3	0	1	6	0	2	6	0	2
	STRONTIUM	3	3	0	3	3	0	6	6	0	6	6	0
	TITANIUM	3	3	0	3	3	0	6	6	0	6	6	0
	THALLIUM	3	0	1	3	0	1	6	0	1	6	0	0
	URANIUM	3	0	3	3	0	3	6	0	6	6	0	6
	VANADIUM	3	0	3	3	0	3	6	0	6	6	0	6
	ZINC	3	2	1	3	3	0	6	6	0	6	6	0
*TOTAL SCAN METALS		72	30	28	72	34	24	141	69	48	141	74	41
*TOTAL GROUP INORGANIC & PHYSICAL		141	82	41	149	102	29	272	190	55	282	202	51
CHLOROAROMATICS	HEXACHLOROBUTADIENE	3	0	0	3	0	0	2	0	0	3	0	0
	123 TRICHLOROBENZENE	3	0	0	3	0	0	2	0	0	3	0	0
	1234 T-CHLOROBENZENE	3	0	0	3	0	0	2	0	0	3	0	0
	1235 T-CHLOROBENZENE	3	0	0	3	0	0	2	0	0	3	0	0
	124 TRICHLOROBENZENE	3	0	0	3	0	0	2	0	0	3	0	0
	1245 T-CHLOROBENZENE	3	0	0	3	0	0	2	0	0	3	0	0
	135 TRICHLOROBENZENE	3	0	0	3	0	0	2	0	0	3	0	0
	HCB	3	0	0	3	0	0	2	0	0	3	0	0
	HEXACHLOROETHANE	3	0	0	3	0	0	2	0	0	3	0	0
	OCTACHLOROSTYRENE	3	0	0	3	0	0	2	0	0	3	0	0
	PENTACHLOROBENZENE	3	0	0	3	0	0	2	0	0	3	0	0

TABLE 4

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SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	SITE RAW TOTAL	RAW POSITIVE	RAW TRACE	TREATED TOTAL	TREATED POSITIVE	TREATED TRACE	SITE 1 TOTAL	SITE 1 POSITIVE	SITE 1 TRACE	SITE 2 TOTAL	SITE 2 POSITIVE	SITE 2 TRACE
CHLOROAROMATICS	236 TRICHLOROTOLUENE	3	0	0	3	0	0	2	0	0	3	0	0
	245 TRICHLOROTOLUENE	3	0	0	3	0	0	2	0	0	3	0	0
	26A TRICHLOROTOLUENE	3	0	0	3	0	0	2	0	0	3	0	0
*TOTAL SCAN CHLOROAROMATICS		42	0	0	42	0	0	28	0	0	42	0	0
CHLOROPHENOLS	234 TRICHLOROPHENOL	1	0	0	0	0	0	.	.	.	.	.	.
	2345 T-CHLOROPHENOL	1	0	0	0	0	0	.	.	.	.	.	.
	2356 T-CHLOROPHENOL	1	0	0	0	0	0	.	.	.	.	.	.
	245-TRICHLOROPHENOL	1	0	0	0	0	0	.	.	.	.	.	.
	246-TRICHLOROPHENOL	1	0	0	0	0	0	.	.	.	.	.	.
	PENTACHLOROPHENOL	1	0	0	0	0	0	.	.	.	.	.	.
*TOTAL SCAN CHLOROPHENOLS		6	0	0	0	0	0	0	0	0	0	0	0
PAH	PHENANTHRENE	2	0	0	3	0	0	.	.	.	.	.	.
	ANTHRACENE	2	0	0	3	0	0	.	.	.	.	.	.
	FLUORANTHENE	2	0	0	3	0	0	.	.	.	.	.	.
	PYRENE	2	0	0	3	0	0	.	.	.	.	.	.
	BENZO(A)ANTHRACENE	2	0	0	3	0	0	.	.	.	.	.	.
	CHRYSENE	2	0	0	3	0	0	.	.	.	.	.	.
	DIMETH. BENZ(A)ANTHR	2	0	0	3	0	0	.	.	.	.	.	.
	BENZO(E) PYRENE	2	0	0	3	0	0	.	.	.	.	.	.

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM ATIKOKAN WTP

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	SITE RAW TOTAL	RAW POSITIVE	RAW TRACE	TREATED TOTAL	TREATED POSITIVE	TREATED TRACE	SITE 1 TOTAL	SITE 1 POSITIVE	SITE 1 TRACE	SITE 2 TOTAL	SITE 2 POSITIVE	SITE 2 TRACE
PAH	BENZO(J) FLUORANTHEN	0	0	0	0	0	0	.	.	.	.	.	.
	BENZO(B) FLUORANTHEN	2	0	0	3	0	0	.	.	.	.	.	.
	PERYLENE	2	0	0	3	0	0	.	.	.	.	.	.
	BENZO(K) FLUORANTHEN	2	0	0	3	0	0	.	.	.	.	.	.
	BENZO(A) PYRENE	2	0	0	3	0	0	.	.	.	.	.	.
	BENZO(G,H,I) PERYLEN	2	0	0	3	0	0	.	.	.	.	.	.
	DIBENZO(A,H) ANTHRAC	2	0	0	3	0	0	.	.	.	.	.	.
	INDENO(1,2,3-C,D) PY	2	0	0	3	0	0	.	.	.	.	.	.
	BENZO(B) CHRYSENE	2	0	0	3	0	0	.	.	.	.	.	.
	ANTHANTHRENE	0	0	0	0	0	0	.	.	.	.	.	.
	CORONENE	2	0	0	3	0	0	.	.	.	.	.	.
*TOTAL SCAN PAH		34	0	0	51	0	0	0	0	0	0	0	0
PESTICIDES & PCB	ALDRIN	3	0	0	3	0	0	2	0	0	3	0	0
	ALPHA BHC	3	0	1	3	0	1	2	0	0	3	0	1
	BETA BHC	3	0	0	3	0	0	2	0	0	3	0	0
	LINDANE	3	0	1	3	0	1	2	0	0	3	0	1
	ALPHA CHLORDANE	3	0	0	3	0	0	2	0	0	3	0	0
	GAMMA CHLORDANE	3	0	0	3	0	0	2	0	0	3	0	0
	DIELDRIN	3	0	0	3	0	0	2	0	0	3	0	0
	METHOXYCHLOR	3	0	0	3	0	0	2	0	0	3	0	0
	ENDOSULFAN I	3	0	0	3	0	0	2	0	0	3	0	0
	ENDOSULFAN II	3	0	0	3	0	0	2	0	0	3	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM ATIKOKAN WTP

SUMMARY TABLE OF RESULTS (1988)

		SITE											
		RAW			TREATED			SITE 1			SITE 2		
SCAN	PARAMETER	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PESTICIDES & PCB	ENDRIN	3	0	0	3	0	0	2	0	0	3	0	0
	ENDOSULFAN SULPHATE	3	0	0	3	0	0	2	0	0	3	0	0
	HEPTACHLOR EPOXIDE	3	0	0	3	0	0	2	0	0	3	0	0
	HEPTACHLOR	3	0	0	3	0	0	2	0	0	3	0	0
	MIREX	3	0	0	3	0	0	2	0	0	3	0	0
	OXYCHLORDANE	3	0	0	3	0	0	2	0	0	3	0	0
	OPDDT	3	0	0	3	0	0	2	0	0	3	0	0
	PCB	3	0	0	3	0	0	2	0	0	3	0	0
	DDD	3	0	0	3	0	0	2	0	0	3	0	0
	PPDDE	3	0	0	3	0	0	2	0	0	3	0	0
	PPDDT	3	0	0	3	0	0	2	0	0	3	0	0
	AMETRINE	3	0	0	2	0	0	2	0	0	3	0	0
	ATRAZINE	3	0	0	2	0	0	2	0	0	3	0	0
	ATRATONE	3	0	0	2	0	0	2	0	0	3	0	0
	CYANAZINE	3	0	0	2	0	0	2	0	0	3	0	0
	DES ETHYL ATRAZINE	3	0	0	2	0	0	2	0	0	3	0	0
	DES ETHYL SIMAZINE	3	0	0	2	0	0	2	0	0	3	0	0
	PROMETONE	3	0	0	2	0	0	2	0	0	3	0	0
	PROPAZINE	3	0	0	2	0	0	2	0	0	3	0	0
	PROMETRYNE	3	0	0	2	0	0	2	0	0	3	0	0
	METRIBUZIN	3	0	0	2	0	0	2	0	0	3	0	0
	SIMAZINE	3	0	0	2	0	0	2	0	0	3	0	0
	ALACHLOR	3	0	0	2	0	0	2	0	0	3	0	0
	METOLACHLOR	3	0	0	2	0	0	2	0	0	3	0	0
*TOTAL SCAN PESTICIDES & PCB		102	0	2	89	0	2	68	0	0	102	0	2

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM ATIKOKAN WTP

SUMMARY TABLE OF RESULTS (1968)

SCAN	PARAMETER	SITE RAW TOTAL	RAW POSITIVE	RAW TRACE	TREATED TOTAL	TREATED POSITIVE	TREATED TRACE	SITE 1 TOTAL	SITE 1 POSITIVE	SITE 1 TRACE	SITE 2 TOTAL	SITE 2 POSITIVE	SITE 2 TRACE
PHENOLICS	PHENOLICS	3	3	0	3	3	0	.	.	.	.	.	.
*TOTAL SCAN PHENOLICS		3	3	0	3	3	0	0	0	0	0	0	0
SPECIFIC PESTICIDES	TOXAPHENE	2	0	0	2	0	0	1	0	0	2	0	0
	2,4,5-T	1	0	0	0	0	0	.	.	.	.	.	.
	2,4-D	1	0	0	0	0	0	.	.	.	.	.	.
	24DCHLRPHENOXYBUTYRC	1	0	0	0	0	0	.	.	.	.	.	.
	2,4 D PROPIONIC ACID	1	0	0	0	0	0	.	.	.	.	.	.
	DICAMBA	1	0	0	0	0	0	.	.	.	.	.	.
	PICHLORAM	0	0	0	0	0	0	.	.	.	.	.	.
	SILVEX	1	0	0	0	0	0	.	.	.	.	.	.
	DIAZINON	0	0	0	0	0	0	.	.	.	.	.	.
	DICHLOROVOS	0	0	0	0	0	0	.	.	.	.	.	.
	CHLORPYRIFOS	0	0	0	0	0	0	.	.	.	.	.	.
	ETHION	0	0	0	0	0	0	.	.	.	.	.	.
	AZINPHOS-METHYL	0	0	0	0	0	0	.	.	.	.	.	.
	MALATHION	0	0	0	0	0	0	.	.	.	.	.	.
	MEVINPHOS	0	0	0	0	0	0	.	.	.	.	.	.
	METHYL PARATHION	0	0	0	0	0	0	.	.	.	.	.	.
	METHYLTRITHION	0	0	0	0	0	0	.	.	.	.	.	.
	PARATHION	0	0	0	0	0	0	.	.	.	.	.	.
	PHORATE	0	0	0	0	0	0	.	.	.	.	.	.
	RELDAN	0	0	0	0	0	0	.	.	.	.	.	.

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM ATIKOKAN WTP

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	SITE RAW TOTAL	RAW POSITIVE	RAW TRACE	TREATED TOTAL	TREATED POSITIVE	TREATED TRACE	SITE 1 TOTAL	SITE 1 POSITIVE	SITE 1 TRACE	SITE 2 TOTAL	SITE 2 POSITIVE	SITE 2 TRACE
SPECIFIC PESTICIDES	RONNEL	0	0	0	0	0	0	.	.	.	.	.	.
	AMINOCARB	0	0	0	0	0	0	.	.	.	.	.	.
	BENOMYL	0	0	0	0	0	0	.	.	.	.	.	.
	BUX	0	0	0	0	0	0	.	.	.	.	.	.
	CARBOFURAN	0	0	0	0	0	0	.	.	.	.	.	.
	CICP	0	0	0	0	0	0	.	.	.	.	.	.
	DIALLATE	0	0	0	0	0	0	.	.	.	.	.	.
	EPTAN	0	0	0	0	0	0	.	.	.	.	.	.
	IPC	0	0	0	0	0	0	.	.	.	.	.	.
	PROPOXUR	0	0	0	0	0	0	.	.	.	.	.	.
	CARBARYL	0	0	0	0	0	0	.	.	.	.	.	.
	BUTYLATE	0	0	0	0	0	0	.	.	.	.	.	.
*TOTAL SCAN SPECIFIC PESTICIDES		8	0	0	2	0	0	1	0	0	2	0	0
VOLATILES	BENZENE	1	0	0	2	0	0	2	0	0	2	0	0
	TOLUENE	1	0	1	2	0	1	2	0	0	2	0	1
	ETHYLBENZENE	1	0	1	2	0	0	2	0	0	2	0	0
	P-XYLENE	1	0	0	2	0	0	2	0	0	2	0	0
	M-XYLENE	1	0	0	2	0	0	2	0	0	2	0	0
	O-XYLENE	1	0	0	2	0	0	2	0	0	2	0	0
	STYRENE	1	0	1	2	0	1	2	0	2	2	0	2
	1,1 DICHLOROETHYLENE	1	0	0	2	0	0	2	0	0	2	0	0
	METHYLENE CHLORIDE	1	0	0	2	0	0	2	0	0	2	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM ATIKOKAN WTP

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	SITE RAW TOTAL	RAW POSITIVE	RAW TRACE	TREATED TOTAL	TREATED POSITIVE	TREATED TRACE	SITE 1 TOTAL	SITE 1 POSITIVE	SITE 1 TRACE	SITE 2 TOTAL	SITE 2 POSITIVE	SITE 2 TRACE
VOLATILES	T1,2DICHLOROETHYLENE	1	0	0	2	0	0	2	0	0	2	0	0
	1,1 DICHLOROETHANE	1	0	0	2	0	0	2	0	0	2	0	0
	CHLOROFORM	1	0	0	2	2	0	2	2	0	2	2	0
	111, TRICHLOROETHANE	1	0	0	2	0	0	2	0	0	2	0	0
	1,2 DICHLOROETHANE	1	0	0	2	0	0	2	0	0	2	0	0
	CARBON TETRACHLORIDE	1	0	0	2	0	0	2	0	0	2	0	0
	1,2 DICHLOROPROPANE	1	0	0	2	0	0	2	0	0	2	0	0
	TRICHLOROETHYLENE	1	0	0	2	0	0	2	0	0	2	0	0
	DICHLOROBROMOMETHANE	1	0	0	2	2	0	2	2	0	2	2	0
	112 TRICHLOROETHANE	1	0	0	2	0	0	2	0	0	2	0	0
	CHLORODIBROMOMETHANE	1	0	0	2	0	2	2	0	2	2	0	2
	T-CHLOROETHYLENE	1	0	0	2	0	0	2	0	0	2	0	1
	BROMOFORM	1	0	0	2	0	0	2	0	0	2	0	0
	1122 T-CHLOROETHANE	1	0	0	2	0	0	2	0	0	2	0	0
	CHLOROBENZENE	1	0	0	2	0	0	2	0	0	2	0	0
	1,4 DICHLOROBENZENE	1	0	0	2	0	0	2	0	0	2	0	0
	1,3 DICHLOROBENZENE	1	0	0	2	0	0	2	0	0	2	0	0
	1,2 DICHLOROBENZENE	1	0	0	2	0	0	2	0	0	2	0	0
	ETHLYENE DIBROMIDE	1	0	0	2	0	0	2	0	0	2	0	0
	TOTL TRIHALOMETHANES	1	0	0	2	2	0	2	2	0	2	2	0
*TOTAL SCAN VOLATILES		29	0	3	58	6	4	58	6	4	58	6	6
*TOTAL GROUP ORGANIC		224	3	5	245	9	6	155	6	4	204	6	8
TOTAL		365	85	46	394	111	35	427	196	59	486	208	59

KEY TO TABLE 5 and 6

A ONTARIO DRINKING WATER OBJECTIVES (ODWO)

1. Maximum Acceptable Concentration (MAC)

1+. MAC for Total Trihalomethanes

1*. MAC for Bacteriological Analyses
Poor water quality is indicated when :
- total coliform counts > 0 < 5
- P/A Bottle Test is present after 48 hours
- Aeromonas organisms are detected in more than 25% of samples in a single submission or in successive submissions from the same sampling site
- Pseudomonas Aeruginosa, Staphylococcus Aureus and members of the Fecal Streptococcus group should not be detected in any sample
- Standard Plate Count should not exceed 500 organisms per ml at 35 ^{0}C within 48 hours

2. Interim Maximum Acceptable Concentration (IMAC)
3. Maximum Desirable Concentration (MDC)
4. Aesthetic or Recommended Operational Guideline
- hardness levels between 80 and 100 mg/L as calcium carbonate are considered to provide an acceptable balance between corrosion and incrustation, water supplies with a hardness >200 mg/L are considered poor and those in excess of 500 mg/L are unacceptable.

B HEALTH & WELFARE CANADA (H&W)

1. Maximum Acceptable Concentration (MAC)
2. Proposed MAC
3. Interim MAC
4. Aesthetic Objective (AO) (for xylenes, the AO is a total)

C WORLD HEALTH ORGANIZATION (WHO)

1. Guideline Value (GV)
2. Tentative GV
3. Aesthetic GV

D US ENVIRONMENTAL PROTECTION AGENCY (EPA)

1. Maximum Contaminant Level (MCL)
2. Suggested No-Adverse Effect Level (SNAEL)
3. Lifetime Health Advisory
4. EPA Ambient Water Quality Criteria

F EUROPEAN ECONOMIC COMMUNITY (EEC)

1. Health Related Guideline Level
2. Aesthetic Guideline Level
3. Maximum Admissable Concentration (MADC)

G CALIFORNIA STATE DEPARTMENT OF HEALTH-GUIDELINE VALUE

H USSR MAXIMUM PERMISSIBLE CONCENTRATION

I NEW YORK STATE AMBIENT WATER GUIDELINE

N/A NONE AVAILABLE

INTERPRETATION OF DATA

The interpretation of analytical results that are obtained from measurements near the limit of detection of the measurement process is subject to greater uncertainty than those at higher concentrations. The principle areas of concern relate to whether the substance has actually been detected, whether it has been properly identified, and whether it is an artifact of the measurement process. In other words, false positives can be caused by the instrumentation or the test procedures used, when in fact these compounds are not present in the sample.

There are several methods to treat data from such measurements:
1. Exclude the low-level data because of this uncertainty factor. However, studies of long-term environmental trends and modelling may be adversely affected by exclusion of such data.
2. Qualify these data so the user is aware of the greater uncertainty associated with their use.

For the Drinking Water Surveillance Program, measurements near the limit of detection of the measurement process are reported qualified by the code "<T". Results quantified by "W" indicate a zero measurement. These results are reported for purposes of modelling and long-term trend analysis and no significance should be attributed to a single determination of a substance below "T" (a single determination may well be a false positive). Repeat analysis or additional data are needed before it can be stated with certainty that the substance in question was truly present. On the other hand, it is less likely that repeated detection of a substance at or near the limit of detection at a specific location is solely due to an artifact in the measurement system, and more likely represents a true positive. However the average of such data is still only an estimate of the amount of substance present subject to the possible biases of the method used.

LABORATORY RESULTS, REMARK DESCRIPTIONS

.	No Sample Taken
BDL	Below Minimum Measurable Amount
<T	Greater Than Detection Limit But Not Confident (SEE INTERPRETATION OF RESULTS ABOVE)
>	Results Are Greater Than The Upper Limit
<=>	Approximate Result
!AW	No Data: Analysis Withdrawn
!CR	No Data: Could Not Confirm By Reanalysis
!CS	No Data: Contamination Suspected
!IL	No Data: Sample Incorrectly Labelled
!IS	No Data: Insufficient Sample
!LA	No Data: Laboratory Accident

!LD	No Data: Test Queued After Sample Discarded
!NA	No Data: No Authorization To Perform Reanalysis
!NP	No Data: No Procedure
!NR	No Data: Sample Not Received
!OP	No Data: Obscured Plate
!QU	No Data: Quality Control Unacceptable
!PE	No Data: Procedural Error - Sample Discarded
!PH	No Data: Sample pH Outside Valid Range
!RE	No Data: Received Empty
!RO	No Data: See Attached Report (no numeric results)
!SM	No Data: Sample Missing
!SS	No Data: Send Separate Sample Properly Preserved
!UI	No Data: Indeterminant Interference
!TX	No Data: Time Expired
A3C	Approximate, Total Count Exceeded 300 Colonies
APL	Additional Peak, Large, Not Priority Pollutant
APS	Additional Peak, Less Than, Not Priority Pollutant
CIC	Possible Contamination, Improper Cap
CRO	Calculated Result Only
PPS	Test Performed On Preserved Sample
RMP	P and M-Xylene Not Separated
RRV	Rerun Verification
RVU	Reported Value Unusual
SPS	Several Peaks, Small, Not Priority Pollutant
UAL	Unreliable: Sample Age Exceeds Normal Limit
UCR	Unreliable: Could Not Confirm By Reanalysis
UCS	Unreliable: Contamination Suspected
UIN	Unreliable: Indeterminant Interference
XP	Positive After X Number of Hours
T# (T06)	Result Taken After # Hours

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ATIKOKAN WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHEMISTRY (FLD)						
FLD CHLORINE (COMB) (MG/L)			DET'N LIMIT = N/A		GUIDELINE = N/A	
OCT	.	2.100	.	.200	.200	.400
NOV	.	.300	.	.300	.100	.200
DEC	.	.400	.	.500	.200	.200
FLD CHLORINE FREE (MG/L)			DET'N LIMIT = N/A		GUIDELINE = N/A	
OCT	.	1.900	.	.900	.100	.100
NOV	.	1.600	.100	.	.100	.100
DEC	.	1.300	.	.	.100	.100
FLD CHLORINE (TOTAL) (MG/L)			DET'N LIMIT = N/A		GUIDELINE = N/A	
OCT	.	4.000	.	1.100	.300	.500
NOV	.	1.900	.100	.300	.200	.300
DEC	.	1.700	.	.500	.300	.300
FLD PH (DIMSNLESS)			DET'N LIMIT = N/A		GUIDELINE = 6.5-8.5(A4)	
OCT	7.300	6.900	7.680	7.680	7.000	7.000
NOV	7.100	6.700	7.000	7.000	7.300	7.100
DEC	6.900	7.300	7.000	7.000	6.900	6.900
FLD TEMPERATURE (DEG.C)			DET'N LIMIT = N/A		GUIDELINE = 15 (A1)	
OCT	3.000	4.000	12.000	12.000	12.000	13.000
NOV	1.400	4.100	12.500	.	12.000	8.000
DEC	3.000	5.000	13.000	7.000	7.000	5.000
FLD TURBIDITY (FTU)			DET'N LIMIT = N/A		GUIDELINE = 1.0 (A1)	
OCT	1.250	.870	1.170	.980	.980	.890
NOV	.860	.820	.790	1.000	.900	.860
DEC	.800	.830	1.140	.840	.840	.800

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ATIKOKAN WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
SITE						
TYPE	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHEMISTRY (LAB)						
ALKALINITY (MG/L)			DET'N LIMIT = .200		GUIDELINE = 30-500 (A4)	
OCT	24.400	14.100	21.700	18.900	15.700	15.700
NOV	23.500	23.400	33.300	32.300	32.600	30.700
DEC	25.500	36.800	38.100	36.300	35.200	34.200
CALCIUM (MG/L)			DET'N LIMIT = .100		GUIDELINE = 100 (F2)	
OCT	7.800	9.200	8.800	8.800	8.200	8.800
NOV	8.000	7.200	7.800	7.800	7.000	7.400
DEC	9.600	8.500	8.800	8.000	8.600	9.400
CHLORIDE (MG/L)			DET'N LIMIT = .200		GUIDELINE = 250 (A3)	
OCT	2.100	ISM	8.700	8.100	8.900	8.400
NOV	2.000	6.400	7.000	6.500	7.200	7.100
DEC	1.400	5.700	6.200	6.000	6.000	6.100
COLOUR (TCU)			DET'N LIMIT = .5		GUIDELINE = 5.0 (A3)	
OCT	42.500	12.000	13.500	15.000	13.500	13.000
NOV	45.000	15.500	17.500	20.000	19.500	19.000
DEC	35.000	11.500	12.500	14.000	14.500	13.500
CONDUCTIVITY (UMHO/CM)			DET'N LIMIT = 1		GUIDELINE = 400 (F2)	
OCT	62	88	95	91	86	86
NOV	62	94	110	105	108	107
DEC	66	116	118	114	111	112
FLUORIDE (MG/L)			DET'N LIMIT = .01		GUIDELINE = 2.400 (A1)	
OCT	.040 <T	.980	.860	.980	.780	.800
NOV	.040 <T	.420	.440	.440	.440	.440
DEC	.020 <T	.880	.520	.500	.520	.480
HARDNESS (MG/L)			DET'N LIMIT = .500		GUIDELINE = 80-100 (A4)	
OCT	26.000	30.000	29.000	28.000	26.000	28.000
NOV	25.000	22.000	24.000	23.000	23.000	23.000
DEC	30.000	26.600	27.000	25.000	27.300	29.000
IONCAL (DMSNLESS)			DET'N LIMIT = N/A		GUIDELINE = N/A	
OCT	3.221	.000 NAF	.762	8.867	1.416	6.399

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ATIKOKAN WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
SITE						
	RAW	TREATED	SITE 1		SITE 2	
TYPE			STANDING	FREE FLOW	STANDING	FREE FLOW
NOV	3.430	2.247	4.607	6.921	11.760	2.534
DEC	8.105	2.103	3.792	2.968	.131	6.305
LANGELIERS INDEX (DMSNLESS)		DET'N LIMIT = N/A		GUIDELINE = N/A		
OCT	-1.591	-2.349 NAF	-2.344	-2.352	-2.121	-2.051
NOV	-1.436	-1.588	-1.277	-1.298	-1.313	-1.344
DEC	-1.383	-1.159	-1.150	-1.231	-1.121	-1.226
MAGNESIUM (MG/L)		DET'N LIMIT = .050		GUIDELINE = 30 (F2)		
OCT	1.500	1.600	1.800	1.600	1.400	1.400
NOV	1.100	1.100	1.200	.900	1.200	1.100
DEC	1.400	1.300	1.300	1.400	1.400	1.400
SODIUM (MG/L)		DET'N LIMIT = .200		GUIDELINE = 200 (C3)		
OCT	1.800	5.400	5.800	6.200	4.800	5.200
NOV	1.600	7.600	10.800	10.400	10.200	10.800
DEC	1.800	12.000	12.200	12.200	11.600	11.800
AMMONIUM TOTAL (MG/L)		DET'N LIMIT = 0.002		GUIDELINE = .05 (F2)		
OCT	.022	.024	.064	.010	.020	.012
NOV	.038	.022	.210	.012	.024	.014
DEC	.048	.012	.224	.008 <T	.008 <T	.008 <T
NITRITE (MG/L)		DET'N LIMIT = 0.001		GUIDELINE = 1.000 (A1)		
OCT	.013	.005	.007	.005	.014	.011
NOV	.003 <T	.003 <T	.005	.004 <T	.004 <T	.003 <T
DEC	.004 <T	.005	.005	.004 <T	.004 <T	.006
TOTAL NITRATES (MG/L)		DET'N LIMIT = .020		GUIDELINE = 10.000 (A1)		
OCT	BDL	.070 <T	.080 <T	.065 <T	.045 <T	.035 <T
NOV	.040 <T	.075 <T	.265	.070 <T	.115	.065 <T
DEC	.095 <T	.085 <T	.285	.080 <T	.080 <T	.075 <T
NITROGEN TOT KJELD (MG/L)		DET'N LIMIT = .020		GUIDELINE = N/A		
OCT	.330	.340	.490	.320	.370	.370
NOV	.410	.350	.580	.340	.360	.330
DEC	.420	.400	.660	.360	.180	.170

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ATIKOKAN WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
SITE						
	RAW	TREATED	SITE 1		SITE 2	
TYPE			STANDING	FREE FLOW	STANDING	FREE FLOW
PH (DIMSNLESS)			DET'N LIMIT = N/A		GUIDELINE = 6.5-8.5(A4)	
OCT	7.470	6.890	6.730	6.780	7.120	7.160
NOV	7.630	7.540	7.670	7.660	7.690	7.660
DEC	7.570	7.710	7.690	7.670	7.760	7.630
PHOSPHORUS FIL REACT (MG/L)			DET'N LIMIT = .0005		GUIDELINE = N/A	
OCT	.000 <T	.005	.	.	.	.
NOV	.001 <T	.004	.	.	.	.
DEC	.000 <T	.003	.	.	.	.
PHOSPHORUS TOTAL (MG/L)			DET'N LIMIT = .002		GUIDELINE = .40 (F2)	
OCT	.008 <T	.013	.	.	.	.
NOV	.002 <T	.003 <T	.	.	.	.
DEC	.008 <T	.011	.	.	.	.
SULPHATE (MG/L)			DET'N LIMIT = .200		GUIDELINE = 500. (A3)	
OCT	3.100	7.480	7.970	7.780	8.500	8.700
NOV	2.500	7.000	6.500	7.000	6.500	6.500
DEC	3.320	8.330	8.510	8.450	8.260	8.250
TURBIDITY (FTU)			DET'N LIMIT = .02		GUIDELINE = 1.00 (A1)	
OCT	1.270	2.420	2.040	2.130	3.400	3.600
NOV	1.580	1.610	2.100	1.800	1.530	1.390
DEC	1.480	1.530	2.200	1.340	1.400	1.300

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ATIKOKAN WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
SITE	RAW	TREATED	SITE 1		SITE 2	
TYPE			STANDING	FREE FLOW	STANDING	FREE FLOW
METALS						
SILVER (UG/L)			DET'N LIMIT = .020	GUIDELINE = 50. (A1)		
OCT	BDL	BDL	.030 <T	.030 <T	BDL	BDL
NOV	BDL	BDL	BDL	BDL	BDL	BDL
DEC	BDL	BDL	BDL	BDL	BDL	BDL
ALUMINUM (UG/L)			DET'N LIMIT = .050	GUIDELINE = 100.(A4)		
OCT	24.000	690.000	540.000	650.000	600.000	740.000
NOV	60.000	560.000	480.000	470.000	500.000	520.000
DEC	19.000	630.000	580.000	680.000	710.000	720.000
ARSENIC (UG/L)			DET'N LIMIT = 0.050	GUIDELINE = 50.0 (A1)		
OCT	1.200	1.800	1.500	1.300	1.300	1.300
NOV	1.000 <T	.930 <T	1.000 <T	.870 <T	1.000 <T	1.000 <T
DEC	1.000 <T	1.300	.940 <T	.990 <T	1.100	1.100
BARIUM (UG/L)			DET'N LIMIT = 0.020	GUIDELINE = 1000. (A1)		
OCT	5.900	4.800	4.100	4.300	4.800	4.600
NOV	6.400	6.300	4.600	4.100	4.800	4.700
DEC	6.200	6.100	5.300	5.200	5.600	5.500
BORON (UG/L)			DET'N LIMIT = 0.200	GUIDELINE = 5000. (A1)		
OCT	6.300 <T	5.100 <T	6.600 <T	6.800 <T	11.000 <T	11.000 <T
NOV	15.000 <T	17.000 <T	22.000	20.000 <T	18.000 <T	19.000 <T
DEC	8.700 <T	17.000 <T	15.000 <T	17.000 <T	14.000 <T	14.000 <T
BERYLLIUM (UG/L)			DET'N LIMIT = 0.010	GUIDELINE = .20 (H)		
OCT	BDL	BDL	BDL	BDL	BDL	BDL
NOV	.050 <T	BDL	.070 <T	.050 <T	.070 <T	.030 <T
DEC	BDL	BDL	.030 <T	BDL	BDL	BDL
CADMIUM (UG/L)			DET'N LIMIT = 0.050	GUIDELINE = 5.000 (A1)		
OCT	BDL	BDL	.080 <T	BDL	.070 <T	BDL
NOV	BDL	BDL	BDL	BDL	BDL	BDL
DEC	BDL	BDL	BDL	BDL	BDL	BDL
COBALT (UG/L)			DET'N LIMIT = 0.020	GUIDELINE = 1000 (H)		
OCT	.030 <T	.120 <T	.220 <T	.150 <T	.090 <T	.120 <T

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ATIKOKAN WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
SITE	RAW	TREATED	SITE 1		SITE 2	
TYPE			STANDING	FREE FLOW	STANDING	FREE FLOW
NOV	.120 <T	.190 <T	.110 <T	.130 <T	.170 <T	.120 <T
DEC	.110 <T	.110 <T	.110 <T	.130 <T	.150 <T	.150 <T
CHROMIUM (UG/L)			DET'N LIMIT = 0.100	GUIDELINE = 50. (A1)		
OCT	.670 <T	.390 <T	1.400	2.100	.910 <T	1.800
NOV	1.400	2.200	2.200	2.100	1.800	2.000
DEC	.290 <T	1.500	1.400	1.400	1.500	1.400
COPPER (UG/L)			DET'N LIMIT = .100	GUIDELINE = 1000 (A3)		
OCT	3.400	3.100	2100.000	470.000	730.000	170.000
NOV	3.700	2.900	930.000	590.000	420.000	67.000
DEC	4.200	2.300	1300.000 RRV	190.000	170.000	67.000
IRON (UG/L)			DET'N LIMIT = 4.000	GUIDELINE = 300. (A3)		
OCT	190.000	130.000	180.000	210.000	310.000	300.000
NOV	230.000	190.000	210.000	220.000	280.000	260.000
DEC	180.000	170.000	190.000	210.000	250.000	250.000
MERCURY (UG/L)			DET'N LIMIT = 0.010	GUIDELINE = 1.000 (A1)		
OCT	BDL	.070	.	BDL	.	.080
NOV	.080	.070	.	BDL	.	BDL
DEC	.070	.060	.	BDL	.	.090
MANGANESE (UG/L)			DET'N LIMIT = .050	GUIDELINE = 50.0 (A3)		
OCT	10.000	8.900	8.500	6.700	19.000	12.000
NOV	22.000	20.000	8.100	7.700	11.000	9.100
DEC	12.000	11.000	7.500	7.200	8.900	8.800
MOLYBDENUM (UG/L)			DET'N LIMIT = 0.020	GUIDELINE = 500 (H)		
OCT	.110 <T	.180 <T	.060 <T	.050 <T	.110 <T	.120 <T
NOV	.070 <T	.190 <T	.130 <T	.130 <T	.140 <T	.120 <T
DEC	.120 <T	.140 <T	.140 <T	.140 <T	.150 <T	.170 <T
NICKEL (UG/L)			DET'N LIMIT = 0.100	GUIDELINE = 50. (F3)		
OCT	.460 <T	1.200 <T	2.900	.750 <T	2.700	.680 <T
NOV	.160 <T	.570 <T	1.600 <T	.210 <T	3.600	.200 <T
DEC	.200 <T	.380 <T	1.300 <T	.450 <T	2.600	.880 <T

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ATIKOKAN WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
SITE				SITE 2		
TYPE	RAW	TREATED	SITE 1 STANDING	SITE 1 FREE FLOW	STANDING	FREE FLOW
LEAD (UG/L) DET'N LIMIT = 0.050 GUIDELINE = 50. (A1)						
OCT	.200 <T	.210	7.600	1.700	9.000	2.300
NOV	.360	1.700	5.500	2.300	10.000	1.000
DEC	.270	.180 <T	5.600	.700	5.700	1.300
ANTIMONY (UG/L) DET'N LIMIT = .050 GUIDELINE = 146. (D4)						
OCT	.070 <T	BDL	.410	.420	.290	.540
NOV	.230	.230	.390	.440	.320	.350
DEC	.180 <T	.190 <T	.260	.200 <T	.400	.440
SELENIUM (UG/L) DET'N LIMIT = 0.200 GUIDELINE = 10. (A1)						
OCT	BDL	BDL	BDL	1.800 <T	BDL	BDL
NOV	BDL	.470 <T	1.100 <T	BDL	.420 <T	.370 <T
DEC	BDL	BDL	BDL	BDL	BDL	BDL
STRONTIUM (UG/L) DET'N LIMIT = .050 GUIDELINE = 2000.(H)						
OCT	24.000	20.000	19.000	21.000	23.000	23.000
NOV	22.000	22.000	21.000	21.000	22.000	21.000
DEC	21.000	22.000	20.000	22.000	22.000	22.000
TITANIUM (UG/L) DET'N LIMIT = .050 GUIDELINE = N/A						
OCT	3.400	12.000	10.000	9.700	3.600	3.500
NOV	8.300	8.300	8.400	8.100	8.300	7.600
DEC	6.600	7.700	6.500	7.100	5.800	6.000
THALLIUM (UG/L) DET'N LIMIT = .010 GUIDELINE = 13. (D4)						
OCT	.020 <T	.030 <T	.050 <T	BDL	BDL	BDL
NOV	BDL	BDL	BDL	BDL	BDL	BDL
DEC	BDL	BDL	BDL	BDL	BDL	BDL
URANIUM (UG/L) DET'N LIMIT = .020 GUIDELINE = 20. (A2)						
OCT	.040 <T	.040 <T	.120 <T	.030 <T	.030 <T	.040 <T
NOV	.050 <T	.030 <T	.030 <T	.030 <T	.040 <T	.030 <T
DEC	.030 <T	.030 <T	.030 <T	.040 <T	.050 <T	.040 <T
VANADIUM (UG/L) DET'N LIMIT = .050 GUIDELINE = 100 (H)						
OCT	.200 <T	.380 <T	.350 <T	.360 <T	.160 <T	.160 <T
NOV	.190 <T	.210 <T	.180 <T	.190 <T	.170 <T	.180 <T

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ATIKOKAN WTP 1986

SITE TYPE	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
DEC	.160 <T	.180 <T	.140 <T	.170 <T	.230 <T	.160 <T
ZINC (UG/L)			DET'N LIMIT = .001		GUIDELINE = 5000. (A3)	
OCT	1.400	2.400	34.000	6.000	45.000	7.000
NOV	1.300	2.700	29.000	16.000	33.000	3.800
DEC	.960 <T	1.300	28.000	4.300	23.000	5.600

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ATIKOKAN WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
SITE			SITE 1		SITE 2	
TYPE	RAW	TREATED	STANDING	FREE FLOW	STANDING	FREE FLOW
PESTICIDES & PCB						
ALPHA BHC (NG/L)			DET'N LIMIT = 1.000		GUIDELINE = 700 (G)	
OCT	BDL	BDL	.	BDL	.	BDL
NOV	1.000 <T	1.000 <T	.	ICS	.	1.000 <T
DEC	BDL	BDL	.	BDL	.	BDL
LINDANE (NG/L)			DET'N LIMIT = 1.000		GUIDELINE = 4000 (A1)	
OCT	BDL	BDL	.	BDL	.	BDL
NOV	1.000 <T	1.000 <T	.	ICS	.	1.000 <T
DEC	BDL	BDL	.	BDL	.	BDL

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ATIKOKAN WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
SITE TYPE	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
PHENOLICS (UG/L)	PHENOLICS		DET'N LIMIT = 0.2		GUIDELINE = 2.00 (A3)	
OCT	3.500	5.200 UAL	.	.	.	.
NOV	3.600	4.600	.	.	.	.
DEC	2.000	3.000	.	.	.	.

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ATIKOKAN WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
SITE			SITE 1		SITE 2	
TYPE	RAW	TREATED	STANDING	FREE FLOW	STANDING	FREE FLOW
VOLATILES						
TOLUENE (UG/L)			DET'N LIMIT = .050	GUIDELINE = 24.0 (B4)		
OCT	.100 <T	BDL	.	BDL	.	BDL
DEC	IBT	.050 <T	.	BDL	.	.050 <T
ETHYLBENZENE (UG/L)			DET'N LIMIT = .050	GUIDELINE = 2.4 (B4)		
OCT	.100 <T	BDL	.	BDL	.	BDL
DEC	IBT	BDL	.	BDL	.	BDL
STYRENE (UG/L)			DET'N LIMIT = .050	GUIDELINE = 46.5 (D2)		
OCT	.300 <T	BDL	.	.100 <T	.	.150 <T
DEC	IBT	.150 <T	.	.250 <T	.	.150 <T
CHLOROFORM (UG/L)			DET'N LIMIT = .100	GUIDELINE = 350 (A1+)		
OCT	BDL	198.000	.	146.000	.	163.000
DEC	IBT	88.200	.	82.100	.	92.300
DICHLOROBROMOMETHANE (UG/L)			DET'N LIMIT = .050	GUIDELINE = 350 (A1+)		
OCT	BDL	2.400	.	2.200	.	2.850
DEC	IBT	2.500	.	2.150	.	2.450
CHLORODIBROMOMETHANE (UG/L)			DET'N LIMIT = .100	GUIDELINE = 350 (A1+)		
OCT	BDL	.200 <T	.	.200 <T	.	.200 <T
DEC	IBT	.300 <T	.	.200 <T	.	.200 <T
T-CHLOROETHYLENE (UG/L)			DET'N LIMIT = .050	GUIDELINE = 10.0 (C2)		
OCT	BDL	BDL	.	BDL	.	.100 <T
DEC	IBT	BDL	.	BDL	.	BDL
TOTL TRIHALOMETHANES (UG/L)			DET'N LIMIT = .500	GUIDELINE = 350 (A1)		
OCT	BDL	200.600	.	148.400	.	166.050
DEC	IBT	91.000	.	84.450	.	94.950

Table 6

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BACTERIOLOGICAL			
STANDARD PLATE COUNT MEMBRANE FILTRATION	CT/ML	0	500/ML(A1)
P/A BOTTLE		0	0 (A1*)
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100mL(A1)
TOTAL COLIFORM BACKGROUND MF	CT/100ML	0	N/A
CHLOROAROMATICS			
HEXACHLOROBUTADIENE	NG/L	1.000	450. (D4)
1,2,3-TRICHLOROBENZENE	NG/L	5.000	10000 (I)
1,2,3,4-TETRACHLOROBENZENE	NG/L	1.000	10000 (I)
1,2,3,5-TETRACHLOROBENZENE	NG/L	1.000	10000 (I)
1,2,4-TRICHLOROBENZENE	NG/L	5.000	10000 (I)
1,2,4,5-TETRACHLOROBENZENE	NG/L	1.000	38000 (D4)
1,3,5-TRICHLOROBENZENE	NG/L	5.000	10000 (D4)
HEXACHLOROBENZENE	NG/L	1.0	10. (C1)
HEXACHLOROETHANE	NG/L	1.000	1900. (D4)
OCTACHLOROSTYRENE	NG/L	1.000	N/A
PENTACHLOROBENZENE	NG/L	1.000	74000 (D4)
2,3,6-TRICHLOROTOLUENE	NG/L	5.000	N/A
2,4,5-TRICHLOROTOLUENE	NG/L	5.000	N/A
2,6,A-TRICHLOROTOLUENE	NG/L	5.000	N/A
CHLOROPHENOLS			
2,3,4-TRICHLOROPHENOL	NG/L	50.	N/A
2,3,4,5-TETRACHLOROPHENOL	NG/L	50.	N/A
2,3,5,6-TETRACHLOROPHENOL	NG/L	50.	N/A
2,4,5-TRICHLOROPHENOL	NG/L	50.	2600000 (D4)
2,4,6-TRICHLOROPHENOL	NG/L	50.	5000. (B1)
PENTACHLOROPHENOL	NG/L	50.	60000. (B1)
CHEMISTRY (FLD)			
FIELD COMBINED CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD FREE CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD TOTAL CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD PH	DMSNLESS	N/A	6.5-8.5(A4)
FIELD TEMPERATURE	°C	N/A	<15 °C(A1)
FIELD TURBIDITY	FTU	N/A	1.0 (A1)
CHEMISTRY (LAB)			
ALKALINITY	MG/L	.200	30-500(A4)
CALCIUM	MG/L	.100	100. (F2)
CYANIDE	MG/L	.001	.20(A1)
CHLORIDE	MG/L	.200	250. (A3)
COLOUR	TCU	.5	5.0 (A3)
CONDUCTIVITY	UMHO/CM	1.	400. (F2)
FLUORIDE	MG/L	.01	2.4 (A1)
HARDNESS	MG/L	.50	80-100(A4)
MAGNESIUM	MG/L	.05	30. (F2)

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
NITRITE	MG/L	.001	1.0 (A1)
TOTAL NITRATES	MG/L	.02	10. (A1)
NITROGEN TOTAL KJELDAHL	MG/L	.02	N/A
PH	DMSNLESS	N/A	6.5-8.5(A4)
PHOSPHORUS FIL REACT	MG/L	.0005	N/A
PHOSPHORUS TOTAL	MG/L	.002	.40(F2)
TOTAL SOLIDS	MG/L	1.	500. (A3)
TURBIDITY	FTU	.02	1.0 (A1)
METALS			
ALUMINUM	UG/L	.050	100. (A4)
ANTIMONY	UG/L	.050	146. (D4)
ARSENIC	UG/L	.050	50. (A1)
BARIUM	UG/L	.020	1000. (A1)
BORON	UG/L	.200	5000. (A1)
BERYLLIUM	UG/L	.010	0.20 (H)
CADMIUM	UG/L	.050	5.0 (A1)
COBALT	UG/L	.020	1000. (H)
CHROMIUM	UG/L	.100	50. (A1)
COPPER	UG/L	.100	1000. (A3)
IRON	UG/L	5.0	300. (A3)
MERCURY	UG/L	.01	1.0 (A1)
MANGANESE	UG/L	.050	50. (A3)
MOLYBDENUM	UG/L	.020	500. (H)
NICKEL	UG/L	.100	50. (F3)
LEAD	UG/L	.020	50. (A1)
SELENIUM	UG/L	.200	10. (A1)
SILVER	UG/L	.020	50. (A1)
STRONTIUM	UG/L	.100	2000. (H)
THALLIUM	UG/L	.010	13. (D4)
TITANIUM	UG/L	.100	N/A
URANIUM	UG/L	.020	20. (A2)
VANADIUM	UG/L	.020	100. (H)
ZINC	UG/L	.020	5000. (A3)
PHENOLICS			
PHENOLICS (UNFILTERED REACTIVE)	UG/L	.2	2.0 (A3)
PESTICIDES & PCB			
ALDRIN	NG/L	1.0	700. (A1)
AMETRINE	NG/L	50.	300000. (D3)
ATRAZINE	NG/L	50.	60000. (B3)
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700. (G)
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300. (G)
GAMMA HEXACHLOROCYCLOHEXANE(LINDANE)	NG/L	1.0	4000. (A1)
ALPHA CHLORDANE	NG/L	2.0	7000. (A1)
GAMMA CHLORDANE	NG/L	2.0	7000. (A1)
BLADEX	NG/L	100.	10000. (B3)
DIELDRIN	NG/L	2.0	700. (A1)
METHOXYCHLOR	NG/L	5.0	100000. (A1)
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000. (D4)
ENDOSULFAN 2 (THIODAN II)	NG/L	4.0	74000. (D4)
ENDRIN	NG/L	4.0	200. (A1)
ENDOSULFAN SULPHATE(THIODAN SULPHATE)	NG/L	4.0	N/A
HEPTACHLOR EPOXIDE	NG/L	1.0	3000. (A1)

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE	
HEPTACHLOR	NG/L	1.0	3000.	(A1)
METOLACHLOR	NG/L	500.	50000.	(B3)
MIREX	NG/L	5.0	N/A	
OXYCHLORDANE	NG/L	2.0	N/A	
O,P-DDT	NG/L	5.0	30000.	(A1)
PCB	NG/L	20.0	3000.	(A2)
O,P-DDD	NG/L	5.0	N/A	
PPDDE	NG/L	1.0	30000.	(A1)
PPDDT	NG/L	5.0	30000.	(A1)
ATRATONE	NG/L	50.	N/A	
ALACHLOR	NG/L	500.	35000.	(D2)
PROMETONE	NG/L	50.	52500.	(D3)
PROPAZINE	NG/L	50.	16000.	(D2)
PROMETRYNE	NG/L	50.	1000.	(B3)
SENCOR (METRIBUZIN)	NG/L	100.	80000.	(B2)
SIMAZINE	NG/L	50.	10000.	(B3)
POLYAROMATIC HYDROCARBONS				
PHENANTHRENE	NG/L	10.0	N/A	
ANTHRACENE	NG/L	1.0	N/A	
FLUORANTHENE	NG/L	20.0	42000.	(D4)
PYRENE	NG/L	20.0	N/A	
BENZO(A)ANTHRACENE	NG/L	20.0	N/A	
CHRYSENE	NG/L	50.0	N/A	
DIMETHYL BENZO(A)ANTHRACENE	NG/L	5.0	N/A	
BENZO(E)PYRENE	NG/L	50.0	N/A	
BENZO(B)FLUORANTHENE	NG/L	10.0	N/A	
PERYLENE	NG/L	10.0	N/A	
BENZO(K)FLUORANTHENE	NG/L	1.0	N/A	
BENZO(A)PYRENE	NG/L	5.0	10.	(B1)
BENZO(G,H,I)PERYLENE	NG/L	20.0	N/A	
DIBENZO(A,H)ANTHRACENE	NG/L	10.0	N/A	
INDENO(1,2,3-C,D)PYRENE	NG/L	20.0	N/A	
BENZO(B)CHRYSENE	NG/L	2.0	N/A	
CORONENE	NG/L	10.0	N/A	
SPECIFIC PESTICIDES				
TOXAPHENE	NG/L	N/A	5000.	(A1)
2,4,5-TRICHLOROBUTYRIC ACID (2,4,5-T)	NG/L	50.	280000.	(B1)
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000.	(A1)
2,4-DICHLORORPHENOXYBUTYRIC ACID	NG/L	200.	18000.	(B3)
2,4-D PROPIONIC ACID	NG/L	100.	N/A	
DICAMBA	NG/L	100.	87000.	(B3)
PICHLORAM	NG/L	100.	2450000.	(D3)
SILVEX (2,4,5-TP)	NG/L	50.	10000.	(A1)
DIAZINON	NG/L	20.	14000.	(A1)
DICHLOROVOS	NG/L	20.	N/A	
DURSBAN	NG/L	20.	N/A	
ETHION	NG/L	20.	35000.	(G)
GUTHION	NG/L	N/A	N/A	
MALATHION	NG/L	20.	160000.	(G)
MEVINPHOS	NG/L	20.	N/A	
METHYL PARATHION	NG/L	50.	7000.	(B3)
METHYLTRITHION	NG/L	20.	N/A	
PARATHION	NG/L	20.	35000.	(B1)

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
PHORATE (THIMET)	NG/L	20.	35. (D2)
RELDAN	NG/L	20.	N/A
RONNEL	NG/L	20.	N/A
AMINOCARB	NG/L	N/A	N/A
BENONYL	NG/L	N/A	N/A
BUX (METALKAMATE)	NG/L	2000.	N/A
CARBOFURAN	NG/L	2000.	18000. (D3)
CICP (CHLORPROPHAM)	NG/L	2000.	350000. (G)
DIALLATE	NG/L	2000.	30000. (H)
EPTAM	NG/L	2000.	N/A
IPC	NG/L	2000.	N/A
PROPOXUR (BAYGON)	NG/L	2000.	90000. (G)
SEVIN (CARBARYL)	NG/L	200.	70000. (A1)
SUTAN (BUTYLATE)	NG/L	2000.	245000. (D3)
VOLATILES			
BENZENE	UG/L	.050	5.0 (B1)
TOLUENE	UG/L	.050	24.0 (B4)
ETHYLBENZENE	UG/L	.050	2.4 (B4)
PARA-XYLENE	UG/L	.100	300. (B4)
META-XYLENE	UG/L	.100	300. (B4)
ORTHO-XYLENE	UG/L	.050	300. (B4)
1,1-DICHLOROETHYLENE	UG/L	.100	7.0 (D1)
ETHLYENE DIBROMIDE	UG/L	.05	50. (G)
METHYLENE CHLORIDE	UG/L	.500	1750. (D3)
TRANS-1,2-DICHLOROETHYLENE	UG/L	.100	350. (D3)
1,1-DICHLOROETHANE	UG/L	.100	N/A
CHLOROFORM	UG/L	.100	350. (A1+)
1,1,1-TRICHLOROETHANE	UG/L	.020	200. (D1)
1,2-DICHLOROETHANE	UG/L	.050	5.0 (D1)
CARBON TETRACHLORIDE	UG/L	.200	5.0 (D1)
1,2-DICHLOROPROPANE	UG/L	.050	10.0 (G)
TRICHLOROETHYLENE	UG/L	.100	5.0 (D1)
DICHLOROBROMOMETHANE	UG/L	.050	350. (A1+)
1,1,2-TRICHLOROETHANE	UG/L	.050	.60(D4)
CHLORODIBROMOMETHANE	UG/L	.100	350. (A1+)
TETRACHLOROETHYLENE	UG/L	.050	10.0 (C2)
BROMOFORM	UG/L	.200	350. (A1+)
1,1,2,2-TETRACHLOROETHANE	UG/L	.050	0.17(D4)
CHLOROBENZENE	UG/L	.100	1510. (D3)
1,4-DICHLOROBENZENE	UG/L	.100	5.0 (B1)
1,3-DICHLOROBENZENE	UG/L	.100	130. (G)
1,2-DICHLOROBENZENE	UG/L	.050	200. (B1)
TRIFLUOROCHLOROTOLUENE	UG/L	.100	N/A
TOTAL TRIHALOMETHANES	UG/L	.500	350. (A1)
STYRENE	UG/L	.05	46.5 (D2)

Appendix A

DRINKING WATER SURVEILLANCE PROGRAM

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality,
- a flagging mechanism for 'Objective' exceedence,
- a definition of contaminant levels and trends,
- a comprehensive background for remedial action,
- a framework for assessment of new contaminants,
- and an indication of treatment efficiency of plant processes.

Program

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario; currently 44 plants are being monitored. Water supply locations have been prioritized for surveillance, based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit. It is estimated that after 4 years of operation, the program will be monitoring 90 locations.

A major goal of the program is to collect valid water quality data, in context with plant operational characteristics at the time of sampling. As soon as sufficient data have been accumulated and analysed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling in order to acquire complete plant process and distribution system details, and to designate (and retrofit if necessary) all sampling systems and locations. This ensures that the sampled water is a reflection of the water itself.

Samples are taken of the raw (ambient water) and the treated water at the treatment plant, and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled.

Sampling is carried out by operational personnel who have been trained in the applicable procedures.

Comprehensive standardized procedures and Field Test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". All laboratory analyses are carried out by the MOE Laboratory Services Branch.

Data Reporting Mechanism

When the analytical results are transferred from the MOE laboratory into the DWSP system, printouts of the completed analyses are sent to the MOE District Officer, the appropriate operational staff and are also retained by the DWSP co-ordinator.

DWSP INPUTS AND OUTPUTS

The DWSP INPUTS and OUTPUTS are illustrated in Fig. 1.

PROGRAM INPUTS

PLANT AND DISTRIBUTION SYSTEM DESCRIPTION

The system description includes plant specific non-analytical information acquired through a questionnaire and initial plant

visit. During the initial assessment of the plant and distribution system the questionnaire content is verified and missing information added. It is intended that all data be kept current with scheduled annual updates.

The PLANT and DISTRIBUTION SYSTEM DESCRIPTION consists of the following seven components.

1. Process component inventory

All physical and chemical processes that the water is subjected to, from the intake pipe to the consumers' tap (where possible), are documented. These include: process type, general description of physical structures, material types, sizes, and retention time for each process within the plant. The processes may be as simple as transmission or as complex as carbon adsorption.

2.Treatment chemicals

Chemicals used in the treatment processes, their function, application point, supplier and brand-name are recorded. The chemical dosages applied on the day of sampling are recorded in DWSP.

3. Process control measurements

Documentation of in-plant monitoring of process parameters (turbidity, chlorine residuals, pH, aluminum residuals) including methods used, monitoring locations and frequency is contained in

this section. In-plant monitoring results are generally not retained in DWSP but are retained by the Water Treatment Plant.

4. Design flow and retention time

The hydraulic capacity, designed and actual, is noted here. Retention time (the time that a block of water is retained in the plant) is also noted. The maximum, minimum and average flow as well as a record of the flow rate on the day of sampling are recorded in DWSP.

5. Distribution system description

This area includes the storage and transmission characteristics of the distribution system after the water leaves the plant.

6. Sampling system

Each plant is assessed for its adequacy in terms of sampling of bacteriological, organic and inorganic parameters. The prime considerations in the assessment and design of the sampling system are:

i/ the sample is an accurate representation of the actual water condition, eg. raw water has had no chemical treatment;

ii/ the water being sampled is not being modified by the sampling system;

iii/ the sample tap must be in a clean area of the plant,

preferably a lab area;

iv/ the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself.

The sampling system documentation includes: origin of the water; date sampling was initiated; size, length and material type (intake, discharge and tap), pump characteristics (model, type, capacity) and flow rate.

7. People

This section contains the names, addresses and phone numbers of current plant management and operational staff, distribution system management and operational staff, Medical Officer of Health and appropriate Ministry of Environment personnel associated with the plant.

FIELD DATA

The second major input to DWSP is field data.

Field data is collected at the plant and from the distribution system sites on the day of sampling. The field data consists of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used,

dosages, flow and retention time on the day of sampling as well as monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free,combined and total), temperature and pH. These parameters are analysed according to standardized DWSP protocols to allow for interplant comparison.

LABORATORY ANALYTICAL DATA

The third major input to DWSP is Laboratory Analytical Data.

Samples gathered from the raw, treated and distribution sampling sites are analyzed for approximately 160 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. The parameters measured may have health or aesthetic implications when present in drinking water. Many of the parameters may be used in the treatment process or may be treatment by-products. Due to the nature of certain analytical instruments parameters may be measured for in a "scan" producing some results for parameters that are not on the DWSP priority list but which may be of interest. The majority of the parameters are measured on a routine basis however, those that are technically more difficult and/or costly to analyse for are done less frequently. These include Specific Pesticides and Chlorophenols.

Although the parameter list is extensive, additional parameters with the potential to cause health or aesthetic related problems

may be added provided reliable analytical and sampling methods exist.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change notation will e be made and intercomparison data documented.

PARAMETER REFERENCE INFORMATION

The fourth major input to DWSP is Parameter Reference Information

This is a catalogue of information for each substance analysed on DWSP. It includes parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses. The Parameter Reference Information is computerized and can be accessed through the Query function of the DWSP database.

An example is shown in fig. 2.

A written copy (hard version) of the Parameter Reference Information will be available in the near future and is a new and sophisticated enhancement to the DWSP.

PROGRAM OUTPUTS

There are four major program outputs, Query, Action Alert, Report Generation and the Annual Report.

QUERY

All DWSP information is easily accessed through the Query function, therefore anything from addresses of plant personnel to complete water quality information for a plant's water supply is instantly available. The DWSP computer system makes relatively complex inquiries manageable. A personal password allowing access into the DWSP query mode in all MOE offices is being developed by the DWSP group.

ACTION ALERTS

Drinking Water quality in Ontario is evaluated against provincial objectives as outlined in the publication, Ontario Drinking Water Objectives (ISBN 0-7729-2725-1 revised 1983). This publication contains health-related Maximum Acceptable Concentrations for thirty substances. Should the reported level of a substance in treated water exceed the Ontario Drinking Water Objective an "Action Alert" requiring resampling and confirmation is issued. This assures that operational staff, health authorities and the public are notified as soon as possible of confirmation of an exceedance and remedial action taken. This report supplies a history of the occurrence of past exceedences at the plant plus a historical summary on the parameter of concern.

In the absence of Ontario Drinking Water Objectives, other agency guidelines which are documented in the Parameter Reference Information may be used. If these guidelines are exceeded the results are flagged and evaluated by DWSP personnel. An "Action Alert" will be issued if warranted.

REPORT GENERATION

Custom reports can be generated from DWSP to meet the needs of the regions and to respond to public requests.

ANNUAL REPORTS

It is the practice of DWSP to produce an annual report containing analytical data along with companion plant information.

FIG. 1

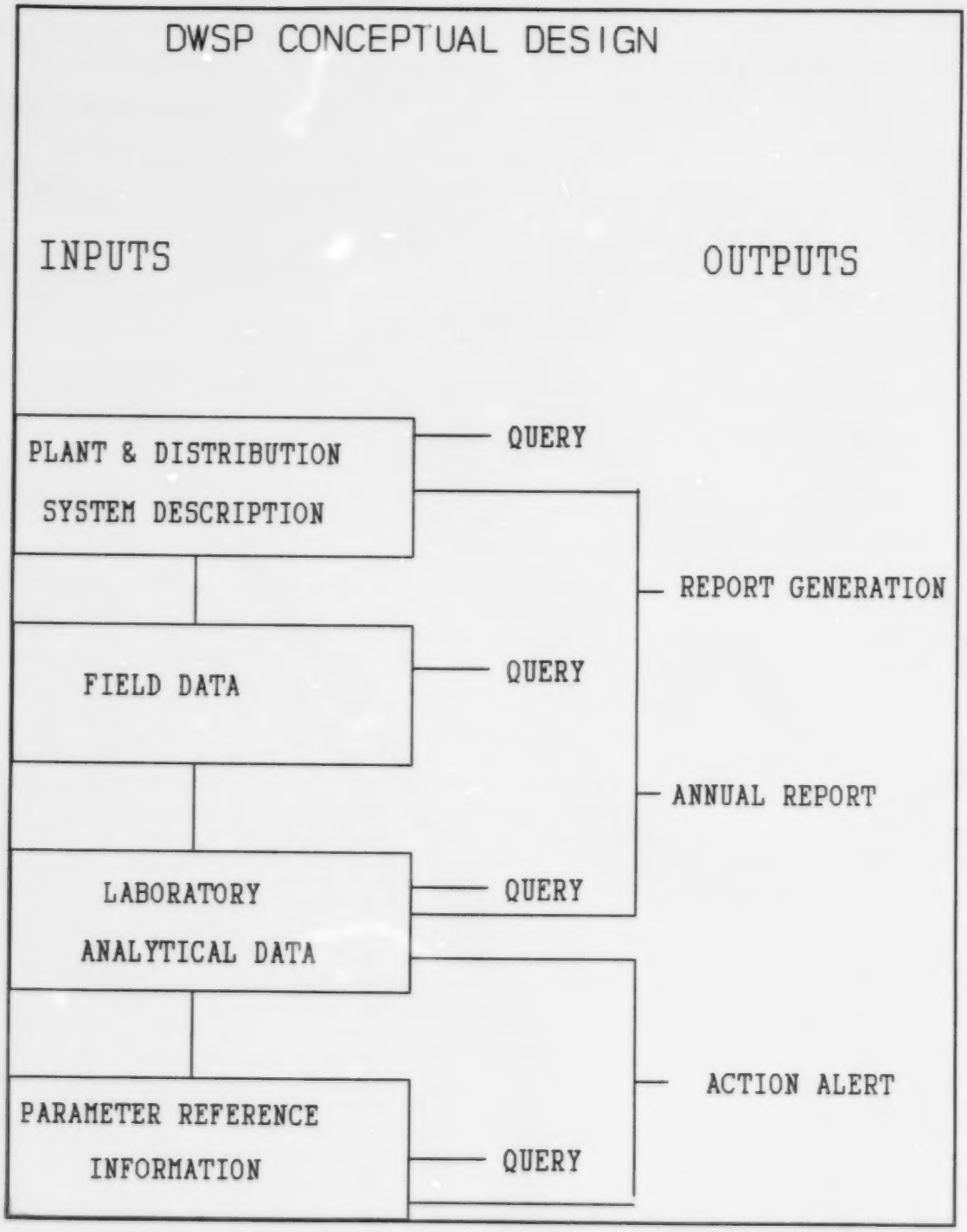
DWSP CONCEPTUAL DESIGN
INPUTS
OUTPUTS
PLANT & DISTRIBUTION SYSTEM DESCRIPTION
FIELD DATA
LABORATORY ANALYTICAL DATA
PARAMETER REFERENCE INFORMATION
QUERY
QUERY
QUERY
QUERY
REPORT GENERATION
ANNUAL REPORT
ACTION ALERT

FIG.2

MOE - DRINKING WATER ASSESSMENT PROGRAM (DWSP)

PARAMETER REFERENCE

(B2001P)
BENZENE

SOURCE	FROM	TO	METHOD	TARG	UNIT	NOTE
EPA	C 86/04		NOMETH	.00	063000 UG/L	RMCL
EPAA	C 80/11		NOMETH	6.60	063000 UG/L	
FERC	C 84/05		NOMETH	1.00	063000 UG/L	
WHO	C 84/01		NOMETH	10.00	064000 UG/L	

DESCRIPTION: NAME: BENZENE
CAS#: 71432
MOLECULAR FORMULAE: C_6H_6
DETECTION LIMIT: (FOR METHOD POCODO) 0.05 UG/L
SYNONYMS: BENZOLE, COAL NAPHTHA, CARBON OIL (27), CYCLOHEXATRIENE (41)
CHARACTERISTICS: COLOURLESS TO LIGHT YELLOW, MOBILE, NON-POLAR LIQUID, OF HIGHLY REFRACTIVE NATURE, AROMATIC, VAPOURS BURN WITH SMOKING FLAME (30)
PROPERTIES:
SOLUBILITY IN WATER: 1780-1800 MG/L AT 25 DEG C (41)
THRESHOLD ODOUR: NO DATA
THRESHOLD TASTE: 0.5 MG/L IN WATER (39)
ENVIRONMENTAL FATE: MAY BIOACCUMUALTE IN LIVING ORGANISMS, APPEARS TO BIOACCUMULATE IN ANIMAL TISSUES THAT EXHIBIT HIGH LIPID CONTENT OR ARE MAJOR METABOLIC SITES (LIVER, BRAIN), SMALL QUANITIES EVAPORATE FROM SOIL OR DEGRADE QUICKLY
SOURCES: PETROLEUM REFINING, SOLVENT RECOVERY, COAL TAR DISTILLATION, FOOD PROCESSING, TANNING.
USES: PREPERATION OF ETHYL BENZENE USED AS A STYRENE MONOMER, DETERGENTS, NYLON, AS INTERMEDIATE IN PESTICIDE PRODUCTION, SOLVENT IN RUBBER INDUSTRY, DEGREASING AND CLEANSING AGENT, GASOLINE.
TOXICITY: RATING 4 (VERY TOXIC); ACUTE - IRRITATES MUCOUS MEMBRANES, SYMPTONS INCLUDE RESTLESSNESS, CONVULSIONS, DEPRESSION, RESPIRATORY FAILURE; CHRONIC - ANEMIA AND LEUKEMIA (45).
CARINOGENICITY: HUMAN CARCINOGEN AND MUTAGEN
REMOVAL: GAC ADSORPTION, PRECIPITATION WITH ALUM FOLLOWED BY SEDIMENTATION, COAGULATION AND FLOCCULATION, SOLVENT EXTRACTION, OXIDATION (41).
MOLECULAR WEIGHT: 78.12 GRAMS
MELTING POINT: 5.5 DEGREES C (27)
BOILING POINT: 80.1 DEGREES C (27)
SPECIFIC GRAVITY: 0.879 AT 20 DEGREES C (27)
VAPOUR PRESSURE: 100 MM AT 26.1 DEGREES C
HENRY'S LAW CONSTANT: 0.00555 ATM M_3/MOLE
LOG OCT./WATER PAR.COEFF: K=1.0 1/N=1.6 R=.97 PH=5.3

Appendix B

DWSP SAMPLING GUIDELINE

i) RAW and TREATED at PLANT

General Chemistry	-500 mL clear plastic bottle -rinse bottle with sample three times and discard water -fill to line
Bacti	-250 mL clear glass bottle with white seal on cap -do <u>not</u> rinse bottle; preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL clear plastic bottle with white lid -rinse bottle and cap three times, discard -fill to line -add 10 drops nitric acid (**Caution:** HNO_3 is corrosive)
Volatiles (OPOPUP)	-250 mL clear glass bottle -do <u>not</u> rinse bottle -tilt bottle when filling -fill bottle completely; there should be no air bubbles.
Organic (OWOC),(OWTRI),(OAPAHX)	-1 liter brown glass bottle per scan -do <u>not</u> rinse bottle -fill to approx. 1" from top -when 'special pesticides' are requested three extra bottles per sample must be submitted
Cyanide	-500 mL clear plastic bottle -do <u>not</u> rinse bottle -fill to approx. 1" from top -add 10 drops sodium hydroxide (**Caution:** NaOH is corrosive)

Mercury	-250 mL clear glass bottle -rinse bottle and cap three times, discard then fill to top of label -add 20 drops each nitric acid and potassium dichromate (**Caution:** HNO_3 and $KCrO_7$ corrosive)
Phenols	-250 mL clear glass bottle -do <u>not</u> rinse bottle -fill to top of label as marked

<u>Steps</u>

1. Let cold water tap run for several minutes.
2. Record time in submission sheet.
3. Record teperature on submission sheet.
4. Fill up all bottles as per instructions.
5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry	-500 mL clear palstic bottle -rinse bottle with sample three times and discard -fill to line
Metals	-500 mL clear plastic bottle with white lid -rinse bottle and cap three times, discard -fill to line -add 10 drops nitric acid (**Caution:** HNO_3 is corrosive)

Steps:

1. Record time on submission sheet.
2. Place bucket under tap and open cold water.
3. Fill to predetermined volume.
4. After mixing the water, record the temperature on the submission sheet.
5. Fill general chemistry and metals bottles.
6. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

iii) Distribution Samples (free flow)

General Chemistry	-500 mL clear plastic bottle -rinse bottle with sample three times and discard water -fill to line
Bacti	-250 mL clear glass bottle with white seal on cap -do <u>not</u> rinse bottle; preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL clear plastic bottle with white lid -rinse bottle and cap three times, discard -fill to line -add 10 drops nitric acid (**Caution:** HNO_3 is corrosive)
Volatiles (OPOPUP)	-250 mL clear glass bottle -do <u>not</u> rinse bottle; preservative has been added -tilt bottle when filling -fill bottle completely; there should be no air bubbles
Organic (OWOC),(OWTRI)	-1 liter brown glass bottle per scan -do <u>not</u> rinse bottle: preservative has been added -fill to approx. 1" from top
Cyanide	-500 mL clear plastic bottle -do <u>not</u> rinse bottle: preservative has been added -fill to approx. 1" from top -add 10 drops sodium hydroxide (**Caution:** NaOH is corrosive)
Mercury	-250 mL clear glass bottle -rinse bottle and cap three times, discard then fill to top of label -add 20 drops each nitric acid and potassium dichromate (**Caution:** HNO_3 and KCrO7 corrosive)

Steps:

1. Record time on submission sheet.
2. Let cold water flow for ten minutes.
3. Record temperature on submission sheet.
4. Fill all bottles as per instructions.
5. Record chlorine residuals (free, combined and total), tubidity and pH on submission sheet.